

REMARKS

The application has been reviewed in light of the Office Action dated June 25, 2009. Claims 1-122 were pending. Claims 1-56 and 101-122 were withdrawn by the Patent Office from examination.

Claims 57-100 are pending for examination on the merits in this application, of which only claims 57 and 79 are in independent form. Claims 58, 65, 69, 71, 72, 80, 85-87 and 91 have been amended.

Election/Restrictions

The June 25, 2009 Office Action notes that examination of the above-identified patent application will be restricted under 35 U.S.C. §121 to one of the following species:

- I. Claims 1-56 and 101-122
- II. Claims 57-100.

During a telephone interview a provisional election was made without traverse by Lindsay McGuinness, Esq. (Reg. No. 38,549) on June 10, 2009 to prosecute claims 57-100. Accordingly, the June 25, 2009 office action indicates claims 1-56 and 101-122 have been withdrawn from consideration by the Patent Office. Applicant hereby affirms and elects without traverse to prosecute species II corresponding to claims 57-100.

Claim Rejections – 35 USC § 112

Claims 58, 65, 69, 71-72, 77, 80, 85-87 and 91 were rejected under 35 U.S.C. §112, second paragraph, for indefiniteness.

The claims have been carefully reviewed with particular attention to the points raised in the Office Action, and all but claim 77 have been amended. No comments on indefiniteness of claim 77 could be found in the Office Action and, accordingly, claim 77 is not amended.

Withdrawal of the rejection under 35 U.S.C. §112, second paragraph, is respectfully requested.

In addition, two obvious typing errors have been corrected in claim 79: deletion of a semicolon, and making mammogram “position” singular to conform to the antecedent. This correction is not in response to a rejection and does not affect the scope of the claim.

Claim Rejections – 35 USC § 103

Claims 57-68, 73, 79-92, 95 and 99 were rejected under 35 U.S.C. § 103(a) as unpatentable over Eberhard et al. USPN 6,751,285) (“Eberhard”) in view of Tang et al. US 2003/0026386 A1 (“Tang”). Claims 70, 72 and 93-94 were rejected under 35 U.S.C. § 103(a) as unpatentable over Eberhard in view of Tang and further in view of Karellas et al. US 2003/0169847 A1 (“Karellas”). Claims 74, 75, 96 and 97 were rejected under 35 U.S.C. § 103(a) as unpatentable over Eberhard in view of Tang and further in view of Tumey et al. USPN 5,941,832 (“Tumey”). Claims 76 and 98 were rejected under 35 U.S.C. § 103(a) as unpatentable over Eberhard in view of Tang and further in view of Wang et al. US 2003/0212327 A1 (“Wang”). Claims 78 and 100 were rejected under 35 U.S.C. § 103(a) as being purportedly unpatentable over Eberhard in view of Tang and further in view of Hsieh et al. USPN 6,574,304 (“Hsieh”).

Applicant has carefully considered the Examiner’s comments and respectfully submits that the claims remaining in this application following entry of this Amendment are patentable.

The application discloses a fused method and system that take both a mammogram (2D image) and tomosynthesis images (3D images) while the patient's breast remains immobilized. Each type of image has advantages and the two types of images complement each other and can provide greater screening and/or diagnostic value. However, none of the prior art of record teaches taking them with the same equipment and while the patient's breast remains compressed.

The primary applied reference, Eberhard, discusses solely 3D tomosynthesis images. While on occasion Eberhard uses the term "mammographic tomosynthesis," this only refers to tomosynthesis images of the breast, not to additionally taking mammograms or mammogram images with the same equipment and while the breast remains compressed.

As known in the art and described in the application being examined, a conventional mammogram is a projection image taken at a sufficiently high x-ray dose to give sufficient resolution to serve for screening and/or diagnosis by a radiologist. In this country, typically two screening mammogram images are taken of each breast, a CC (cranio-caudal) mammogram and an MLO (mediolateral oblique) mammogram. The breast is released from compression after taking a mammogram at one of the CC and MLO positions and then the x-ray gantry is moved to the other position and the breast is compressed again. This entails moving the combination of the x-ray source, the x-ray imaging receptor and the breast compressing mechanism and any x-ray grid that may be used. In contrast, in tomosynthesis imaging a projection image is taken at each of several (e.g., 15-20) different angles of the x-ray beam relative to the breast while the breast remains compressed, and each individual tomosynthesis projection image is taken at a much lower x-ray dose than for a mammogram and produces an image that has substantially less (contrast) resolution than present in a mammogram. The several tomosynthesis projection images taken of the same breast are computer-processed to generate images of breast slices.

The Background section of this application notes that there are mammography systems that do not take tomosynthesis images, and there are tomosynthesis systems that do not take mammograms. But, the prior art of record does not teach a system that carries out a method of providing both a mammogram and tomosynthesis images while the patient's breast remains compressed, and does not teach a fused mammogram/tomosynthesis system that takes both types of images without the need to release the patient's breast from compression and move the patient to other x-ray equipment.

Claim 57 recites a method that images a patient's breast with x-rays to obtain both data for a conventional mammogram and data for tomosynthesis images in a single breast compression. In addition, the claim recites that an anti-scatter grid is used at least for the mammogram position but not for at least some of the tomosynthesis positions. And, the claim recites forming and displaying both a mammogram image and tomosynthesis images.

The principal reference, Eberhard, does not teach the method of claim 57. The Office Action at page 6 refers to Fig. 1 and col. 2, l. 48 – col. 4, l. 4, but this portion of Eberhard discusses only a 3D tomosynthesis data set, not a mammogram image. Eberhard states that the “imaging system 10 generates a three-dimensional dataset” (col. 2, ll. 48-50) and that the breast is compressed and “views of breast 12 are then acquired from at least two projection angles 18 to generate a projection dataset of the volume of interest” and that the “plurality of views represent the tomosynthesis projection dataset” (col. 4, ll. 2-5). No teaching could be found in Eberhard of additionally acquiring image data representing a mammogram with the equipment of Fig. 1, or of forming and displaying both a mammogram and tomosynthesis images of the breast.

The Office Action also refers at page 6 to col. 6, ll. 9-18 in Eberhard regarding using a grid for acquiring image data for some but not all of the imaging positions. However, the only

discussion that could be found in this portion of Eberhard pertains to not using a grid in any of the imaging positions. No teaching could be found in Eberhard of using a grid in any imaging position, much less of selectively using a grid on some but not all positions.

The Office Action also refers at page 6 to “col. 3, l. 7, l. 64; claims 16” in connection with displaying a mammogram and tomosynthesis images. No teaching of taking a mammogram image could be found in Eberhard, and no teaching of displaying a mammogram. Claim 16 in Eberhard refers to generating “a plurality of two-dimensional images of the breast” but they are the tomosynthesis 2D projection images that according to the last paragraph of the claim are used to “generate at least one three-dimensional image.” They are tomosynthesis images, not a mammogram image.

Last regarding the features recited in claim 57, the Office Action at page 6 refers to col. 4, l. 47- col. 5, l. 60 regarding doses related to breast thickness such that a mammogram can be acquired at higher dose than a tomosynthesis image. However, this portion refers only to taking tomosynthesis images at possibly different x-ray dose to the patient. No teaching could be found in this portion of Eberhard of taking a mammogram image, as distinguished from the tomosynthesis images that form the 3D set of projection tomosynthesis images reconstructable into tomosynthesis slice images through computer processing.

A secondary reference, Tang, was cited as teaching anti-scatter grids. However, as Eberhard does not teach acquiring a mammogram in addition to tomosynthesis images, and also does not teach the use of a grid, much less the selective use of a grid when acquiring a mammogram but not when acquiring at least some of the tomosynthesis images, it is submitted that the mere discussion in Tang of a grid does not supply the missing teaching in the primary

reference, Eberhard, and that it would not have been obvious to modify Eberhard's method based on Tang to carry out the method recited in claim 57.

Claim 79 is the remaining independent claim. It is a system claim that recites, among other things, that the system forms "at least one mammogram image and tomosynthesis images of the breast" and further recites "an anti-scatter grid selectively movable in the path of said x-rays ... [and] being in said path for the mammogram position but being out of said path for at least some of the tomosynthesis positions." As discussed in connection with the other independent claim (claim 57), no teaching of such features could be found in the primary reference, Eberhard, and the mere teaching of an anti-scatter grid in the secondary reference, Tang, would not have made it obvious to modify Eberhard to the extent of forming both a mammogram image and tomosynthesis images using the same system while the patient's breast remains compressed and without moving the patient to a different x-ray machine, and using the grid when acquiring the mammogram but not when acquiring at least some of the tomosynthesis images.

All of the remaining claims are in dependent form: claims 58-78 depend directly or indirectly from claim 57, and claims 80-100 depend directly or indirectly from claim 79. It is submitted that the dependent claims are patentable at least for the reason that they depend from claims that are submitted to be patentable over Eberhard and Tang as discussed above, although at least some of the dependent claims recite additional patentable features, as discussed below in connection with additional secondary references.

A secondary reference, Karellas, was cited regarding dependent claims referring to acquiring image data with x-rays up to 50 kVp. However, the pertinent dependent claims (e.g., claim 72) depend from claims that pertain to imaging the breast while Karellas discusses using

such x-rays in fluoroscopy. While fluoroscopy may use such high x-ray energy for other body parts, this does not suggest that the fluoroscopy energy is known for use in imaging the breast in mammography or tomosynthesis, and it would not have been obvious to use in the method of claim 57 or the system of claim 79.

Another secondary reference, Tumey, is cited in connection with concurrent viewing of the mammogram and tomosynthesis images. The pertinent claims (e.g., claim 74) specifically refer to such images while Tumey refers to displaying different mammographic images or regions of interest (ROI) thereof. No teaching could be found in Tumey of also displaying tomosynthesis images. Thus, Tumey does not supply the teaching regarding concurrent viewing missing from the other applied references.

Yet another secondary reference, Wang, is cited in connection with displaying the mammogram and tomosynthesis images on adjacent screens. However, as the Office Action notes at page 9 (paragraph 17) Wang discusses displaying a mammogram and ultrasound images, not x-ray tomosynthesis images.

Last, the Office Action cites Hsieh as a secondary reference concerning tomosynthesis images that represent thick slices of the breast. However, the images of thick slices recited in the pertinent claims (e.g., claim 78) are images each reconstructed from a number of projection tomosynthesis images of the breast, where each projection image is in a plane transverse to the x-rays, while the slice images in Hsieh are computed tomography images from x-rays substantially in the plane of the slice image. There is very little that is similar between the tomosynthesis images of the breast referred to in the pertinent claims and the computed tomography (CT) images of Hsieh.

In view of the remarks herein above, Applicants submit that the application is allowable. Accordingly, Applicants earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that are required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Paul Teng", is written over a horizontal line.

Paul Teng, Reg. No. 40,837
Attorney for Applicant
COOPER & DUNHAM LLP
Tel.: (212) 278-0400

Date: September 25, 2009